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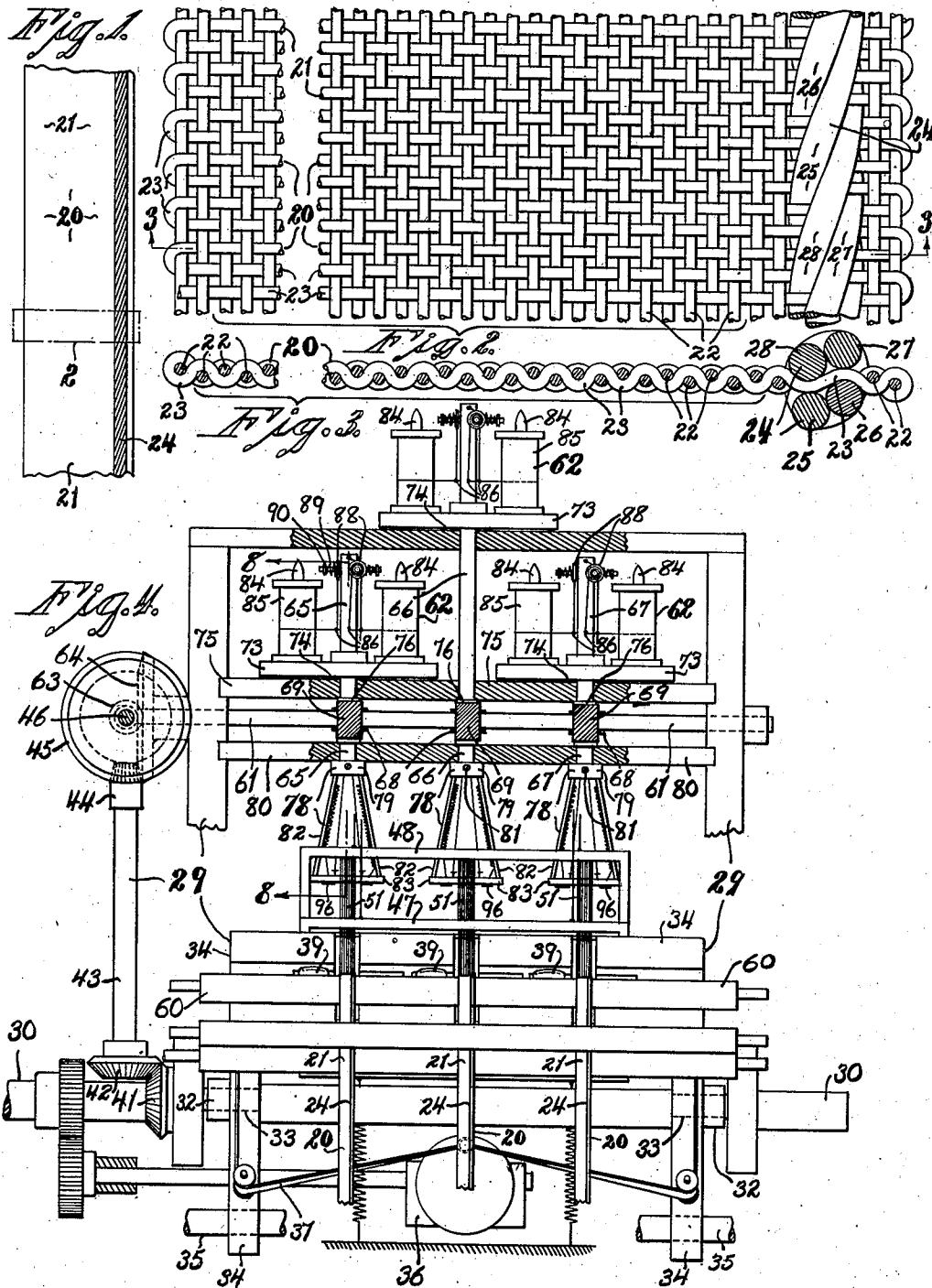
D. B. BROWNLOW ET AL

2,383,767

MACHINE FOR MAKING CORDED TAPE

Filed Feb. 1, 1944

4 Sheets-Sheet 1



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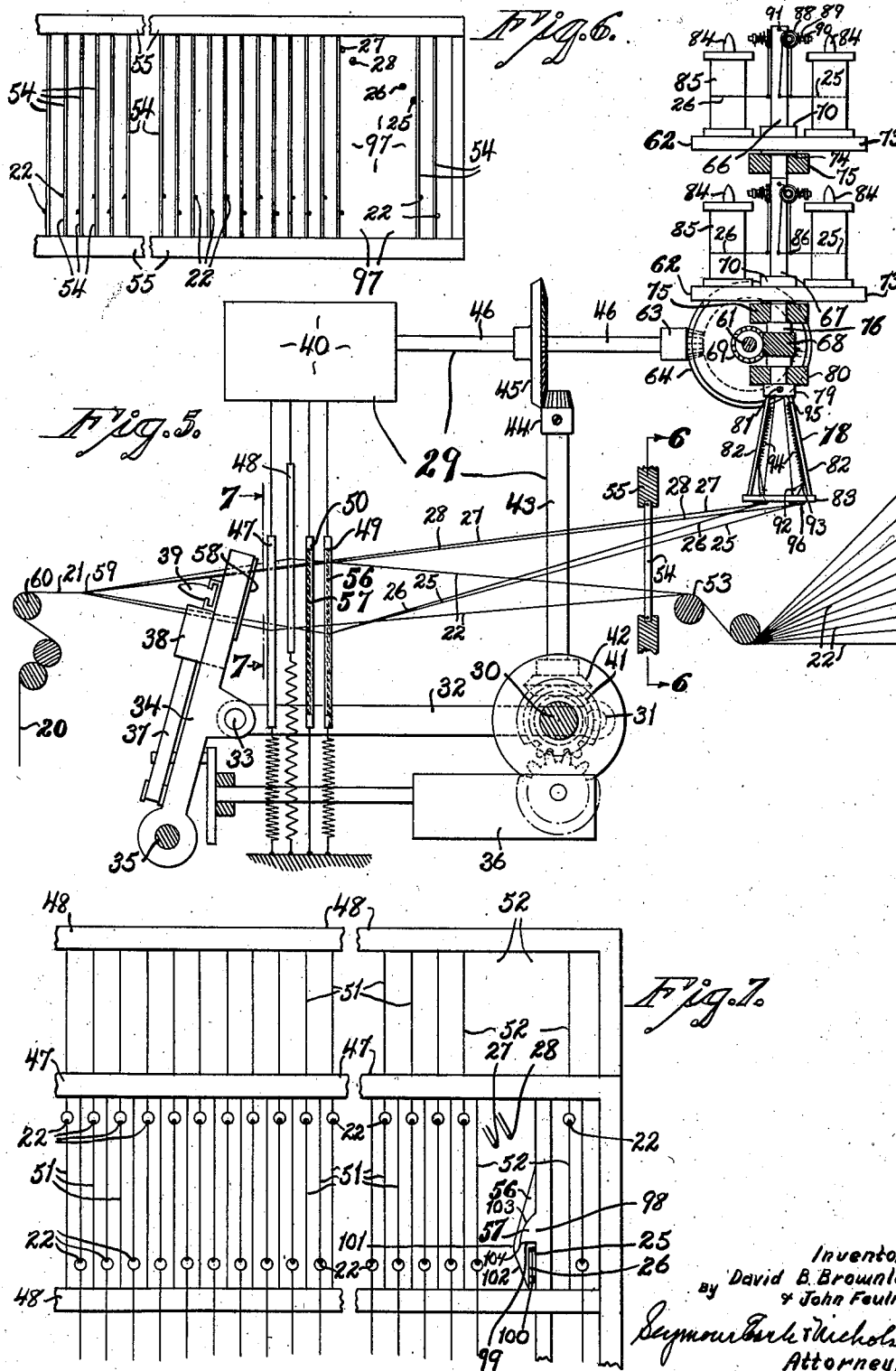
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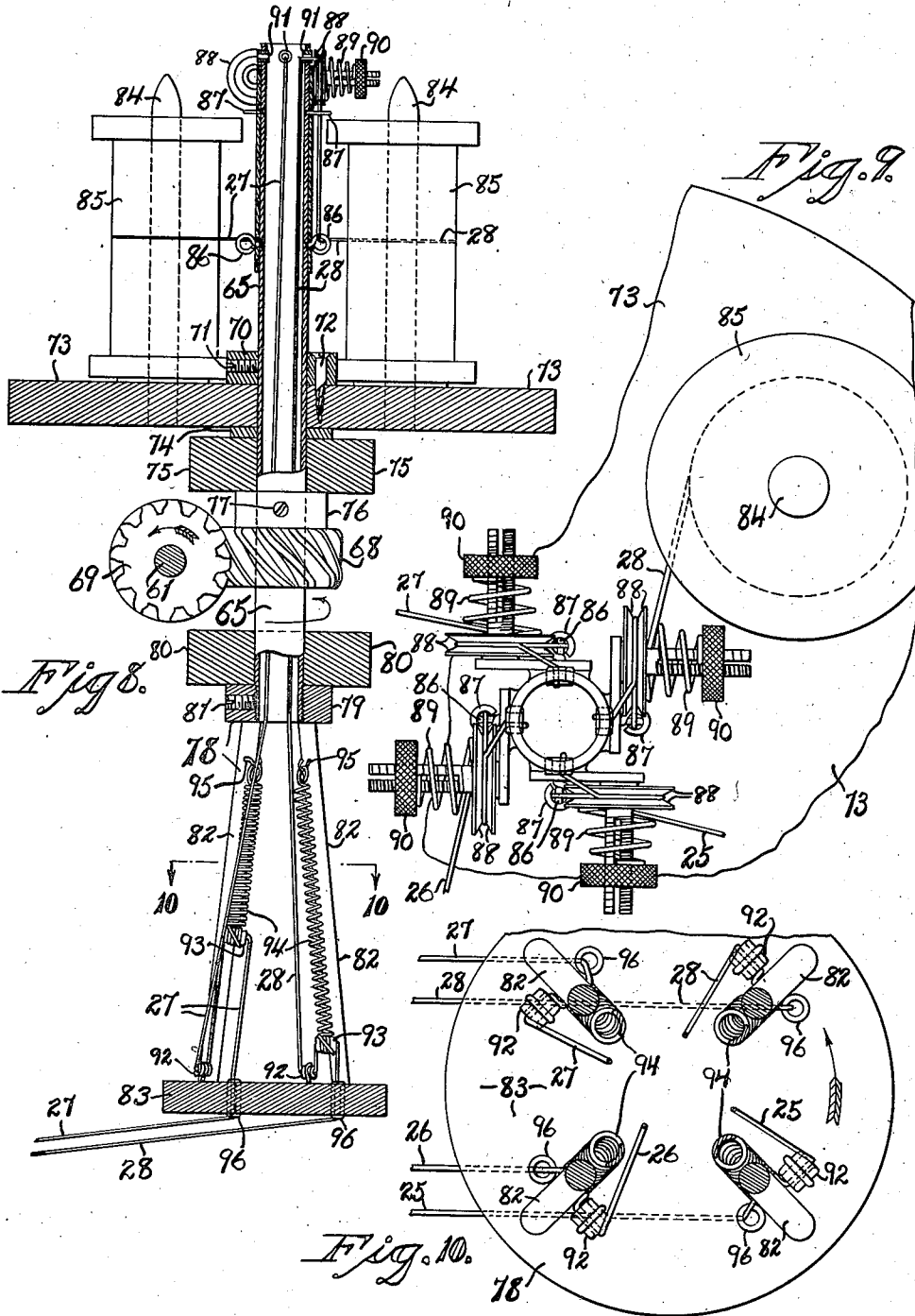
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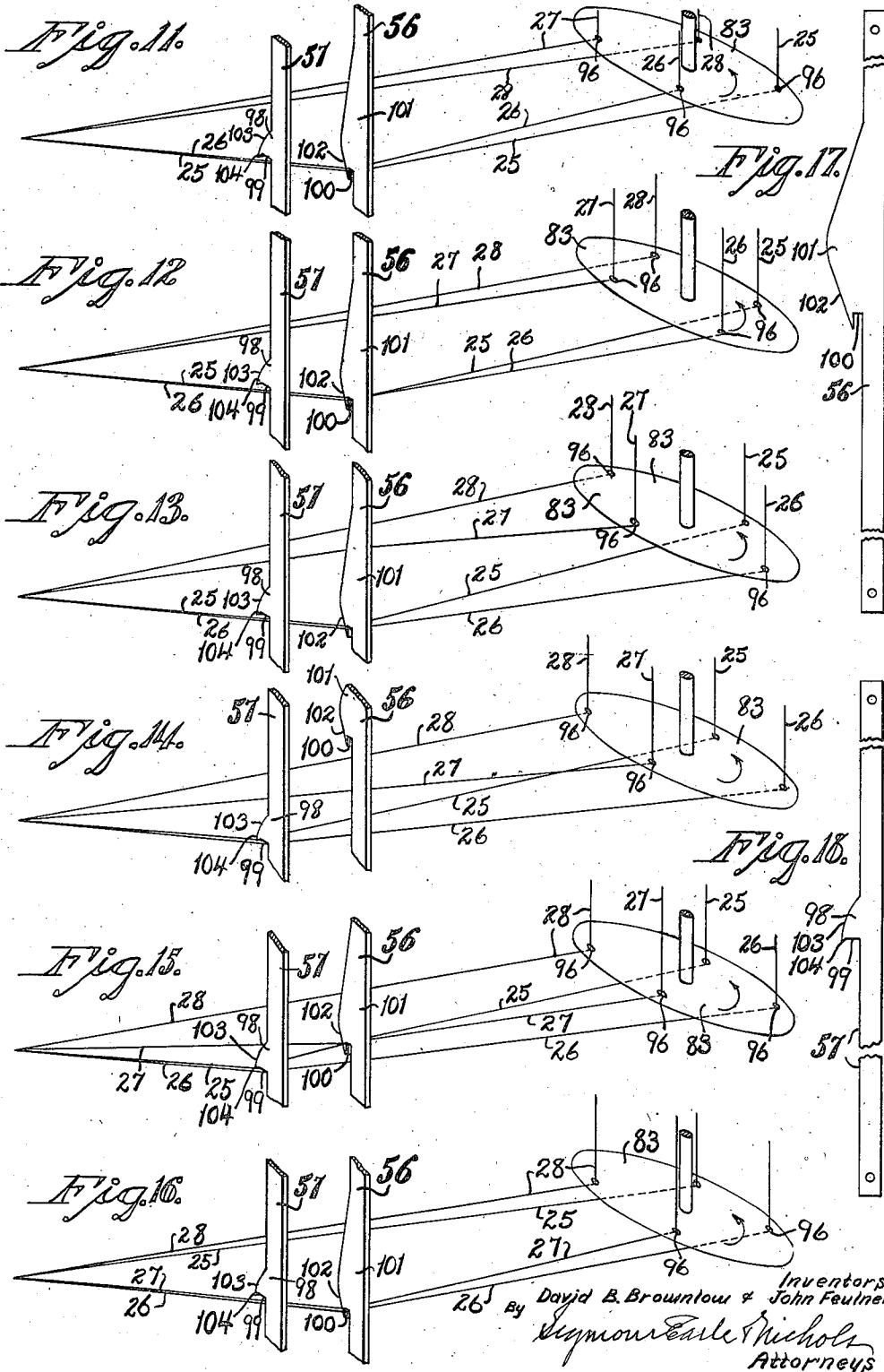
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UNITED STATES PATENT OFFICE

2,383,767

MACHINE FOR MAKING CORDED TAPE

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4 Claims. (Cl. 139—11)

This invention relates to an improved machine for making corded tape, and particularly for making tape having a twisted corded edge for mounting slide-fasteners or the like thereon.

An object of this invention is to provide an improved machine for making woven tape having a twisted corded edge, in which weft strands of the tape are interwoven between certain of the twisted cord-strands of the twisted cord.

With the above and other objects in view, as will appear to those skilled in the art from the present disclosure, this invention includes all features in the said disclosure which are novel over the prior art.

In the description and claims, the various parts and steps are identified by specific terms for convenience, but they are intended to be as generic in their application as the prior art will permit.

In the accompanying drawings forming part of the present disclosure, in which one way of carrying out the invention is shown for illustrative purposes:

Fig. 1 is a front elevation or face view of a piece of corded tape that can be made by the machine of the present invention;

Fig. 2 is a view similar to Fig. 1 of a schematic illustration, on an enlarged scale, of the area 2 of Fig. 1;

Fig. 3 is a transverse sectional view taken on the line 3—3 of Fig. 2;

Fig. 4 is a schematic front elevation of a machine made in accordance with the present invention, by which three corded tapes like the tape illustrated in Figs. 1 to 3, can be made simultaneously;

Fig. 5 is a schematic side elevation of the machine shown in Fig. 4;

Fig. 6 is an enlarged vertical sectional view taken on the line 6—6 of Fig. 5, showing one end-portion of the back-reed or warp-guide for maintaining the warps for a tape-body in proper positions, while permitting the cord-strands to be twisted;

Fig. 7 is an enlarged vertical sectional view taken on line 7—7 of Fig. 5, illustrating one end-portion of the shedding-harnesses for the warp strands of the tape-body;

Fig. 8 is an enlarged vertical sectional view taken on line 8—8 of Fig. 4, illustrating one of the three essentially-identical cord-strand twisting mechanisms;

Fig. 9 is an enlarged fragmental top plan view of Fig. 8;

Fig. 10 is an enlarged horizontal sectional view taken on line 10—10 of Fig. 8;

Figs. 11 to 16 inclusive are schematic perspective views illustrating successive stages of operation of one of the three essentially-identical mechanisms for twisting and shedding the cord-strands of the twisted cord;

Fig. 17 is a front elevation of one of the three identical cord-strand removing-and-shedding members; and

Fig. 18 is a front elevation of one of the three identical cord-strand shedding-hooks.

Referring to the drawings, Figs. 1 to 3 illustrate a corded tape 20 which can be manufactured on the machine of the present invention. The tape 20 includes a relatively-thin tape-body 21 formed of longitudinal warp-strands 22 interwoven with transverse weft strands or weft picks 23, and includes a relatively-thick twisted cord 24 formed of a plurality of twisted cord-strands 25, 26, 27 and 28, with the weft strands 23 woven transversely between certain of the twisted cord-strands as shown.

The main portion of the machine may be constructed in accordance with any one of a number of different types of weaving looms or machines modified in accordance with applicants' invention. The particular machine 29 schematically illustrated in the drawings, is adapted to simultaneously manufacture three identical tapes 20, and includes a main drive-shaft 30, which by means of cranks 31, and driving-rods 32 pivoted at 33 to the batten 34, oscillates the batten about its pivot 35 (Fig. 5). The drive-shaft 30 also, through any suitable shuttle movement or mechanism 36, including the flexible strap 37 which actuates any suitable operating mechanism mounted in the shuttle-box 38 secured on the front of the batten 34, serves to actuate the three shuttles 39 in any suitable way well known to those skilled in the art.

The main drive-shaft 30 also serves to drive any suitable shedding movement 40 through gears and shafts 41, 42, 43, 44, 45 and 46 for actuating the harness-frames 47, 48 and 49. A harness-frame 50 is mounted to be stationary. Each of the two harness-frames 47 and 48 has a plurality of heddles 51 which accomplishes the shedding of the warp strands 22 in a usual way well known to those skilled in the art. And each of the harness-frames 47 and 48 is provided with three large spaces 52 free of heddles, so as to provide ample space for the three sets of cord-strands 25, 26, 27 and 28 of the three tapes being made, to extend through without hindrance to their

twisting movement, only one space 52 being shown in the fragmental drawing of each of the frames 47, 48 in Fig. 7. The harness-frames 49 and 50 cooperate together to bring about the proper shedding of the twisted cord-strands 25, 26, 27 and 28 as will be hereinafter described. The frame 49 carries nothing but three twisted cord-strand removing-and-shedding members 56 (only one being shown) and the stationary frame 50 carries nothing but three shedding-hooks 57 (only one being shown).

The warp strands 22 can be fed to the machine in any suitable way from any suitable means, and in order to interfere as little as possible with the illustration of the remainder of the mechanism in Fig. 5, are shown as entering from the rear of the machine at the right side of Fig. 5 and passing over the loom-beam 53 and then through the spaces between the wires 54 of the back-reed or warp-guide 55, then one set of alternate warps passes through the eyes of the heddles 51 of harness-frame 48 and a second set of the remaining alternate warps passes through the eyes of the heddles 51 of harness-frame 47, then through the usual weft-packing reed 58 of the batten 34, then to the weaving-and-twisting point 59 where they are woven to form the three tape-bodies 21 of the three tapes 20, and then over the take-up roller 60.

The main drive-shaft 30 of the machine 29 also drives the main-shaft 61 of the three essentially-identical cord-twisting mechanisms 62 through gears and shafts 41, 42, 43, 44, 45, 46, 63 and 64. The upstanding tubular shafts 65, 66 and 67 of the three cord-twisting mechanisms 62 are each driven by a spiral-gear 68 meshing with one of three spiral-gears 69 secured to the shaft 61. The shaft 66 is longer than either of the other two shafts 65, 67, in order to enable the placing of the three cord-twisting mechanisms close together. The three essentially-identical twisting-mechanisms are for twisting the cord-strands 25, 26, 27 and 28 of the three tapes 20 which are made simultaneously. Therefore, only one of the three shafts, namely, shaft 65 and the parts it carries, will be specifically described.

A collar 70 (Fig. 8) is firmly secured to the tubular shaft 65 by a set-screw 71, and screws 72 (Fig. 8, only one of which is shown) secure a table 73 to the collar 70. The table 73 rests upon a washer 74 which, in turn, is supported upon the frame cross-member 75. The hub 76 of the gear 68 is secured to the shaft 65 by the set-screw 77. A cord-strand twisting-head 78 has a collar 79 at its upper end which is firmly secured upon the lower end of the tubular shaft 65 adjacent the underside of the frame cross-member 80, by being threaded thereon and may be held in non-rotatable locked position in any given threaded position by means of a set-screw 81. Four rods or bars 82 of the twisting-head 78 are firmly connected to the collar 79 and flare downward to a head-plate 83 to which they are firmly secured.

Firmly secured to the table 73 are four spool-holding pins 84, on each of which is mounted a spool 85. As the four cord-strands 25, 26, 27 and 28 of the cord 24 of one of the tapes 20 are fed from the four spools 85 in essentially-identical manner, only one of these cord-strands will be specifically described in its passage from a spool 85 to its position outside of the head-plate 83.

Thus, referring to Figs. 8, 9 and 10, the cord-strand 28 in unwinding from the right-hand spool

85 of Fig. 8, passes through the eyelets 86 and 87 secured to the tubular shaft 65, then passes between the pair of strand-tensioning friction-disks 88, which latter disks are normally held adjustably pressed together by means of a coil-spring 89 and nut 90, then passes through an eyelet 91 mounted in the tubular shaft 65, then passes downwardly through the tubular shaft 65 and through an eyelet 92 secured to the head-plate 83, then through an eyelet 93 carried in the end of a coil-spring 94, the upper end of which is secured to a hook 95 secured in one of the rods 82, then passes downwardly from the eyelet 93 through an eyelet 96 in the head-plate 83.

The four cord-strands 25, 26, 27 and 28 all pass similarly downwardly through eyelets 96 in the head-plate 83 of the twisting-head 78 and then all four cord-strands pass forwardly through one of the three large open spaces 97 (Fig. 6, only one of which is shown) of the back-reed or warp-guide 55, then through frame 49 (Fig. 5) at the left of the removing-and-shedding member 56 (Fig. 7) carried by the frame 49, then through frame 50 at the left of the shedding-hook 56 carried by the frame 50, then through the large open spaces 52 of the frames 48 and 47, then through the weft-packing reed 58 to the weaving-and-twisting point 59, from where the completed tape 20 passes over the take-up roll 60. The coil-springs 94 equalize the tension on each of the cord-strands so as to avoid excessive tension being placed on any of the cord-strands as the head-plate 83 rotates.

In making one of the tapes 20 illustrated in the drawings, the cord-strands 25, 26, 27 and 28 of such a tape are given one-quarter of a complete twist for every four picks of the weft strand 23, although it will be appreciated that a greater or less number of picks per quarter-twist could be employed. Thus, by observing Fig. 2 of the drawings, it will be seen that four picks are illustrated as passing transversely beneath the cord-strands 28 and 27, then four more picks pass beneath the cord-strands 25 and 26, and so on. Thus, for each complete cycle consisting of forward and back movement of the batten 34 in packing one pick, the two harness-frames 47 and 48 shift to their opposite positions to change the shedding of the alternate set of warps 22 to produce a simple basket-weave construction as illustrated in Figs. 2 and 3 of the drawings, although it will be appreciated that any other desired weave for the tape-body 21 may be accomplished by employing a suitable number of harness-frames and operating them at proper timing and sequence, all as is well understood by those skilled in the art.

Inasmuch as four weft picks are formed for each quarter-twist of the cord-strands, that means that the main drive-shaft 30 has a speed of rotation which is sixteen times the speed of rotation of the twisting-head 78 in order to produce the particular corded tape shown in the drawings. All weft picks pass transversely between the four cord-strands with two cord-strands above and two below each pick, although the angle of passage of the portions of the picks that extend between the cord-strands varies in successive picks of any group of four picks in accordance with the stresses which are present as the result of the twisting of the cord strands.

In order to at all times maintain a proper shedding of the cord-strands, so that two cord-strands are always in the upper shed and two in the lower

shed when any pick is being formed by passage of the shuttle 39, special mechanism is employed as will presently be described. As will be seen from Fig. 5 of the drawings, the head-plate 83 of the twisting-head 78 is at such a height above the horizontal plane through the weaving-and-twisting point 59, that the two strands 27 and 28 in Fig. 5 are in proper position in the upper shed without any mechanism being needed to move them to this upper shedded position, but merely as a result of the head-plate 83 being located well above the horizontal plane through the weaving-and-twisting point 59. In order to shed the cord-strands 25 and 26 and bring them into their lower shed position, the removing-and-shedding member 56 carried by the harness-frame 49, and the shedding-hook 57 carried by the harness-frame 50, are employed.

The shedding-hook 57 and harness-frame 50 are at all times stationary, as will be seen from Figs. 11 to 16 illustrating successive stages of the shedding of the four cord-strands. While four weft picks are being formed in the tape, the head-plate 83 will rotate through the stages illustrated in Figs. 11 to 16 inclusive. The positions of rotation illustrated in Figs. 12, 13 and 14 each represent one-sixteenth of a rotation from the position shown in the preceding figure. The position shown in Fig. 15 is a further one-thirty-second rotation from the position shown in Fig. 14, and Fig. 16 represents a further one-thirty-second rotation from that shown in Fig. 15. As stated heretofore, the shedding-hook 57 is permanently stationary and acts solely in the role of a holding-hook or -member to hold in a downwardly-shedded position such of the cord-strands as are brought beneath the hook-portion 98 of the shedding-hook 57 to engage the under surface 99 of the hook-portion 98. While the head-plate 83 rotates through one-eighth of a rotation from the position of Fig. 11 to the position of Fig. 13, the member 56 temporarily remains stationary. By the time the head-plate 83 has rotated another one-sixteenth of a rotation to the position shown in Fig. 14, the member 56 has been raised to the position shown in Fig. 14, but this does not affect the individual strands so far as their effective shedded position is concerned because, while the rotation of the twisting-head 83 has caused the positions of the four strands to be shifted somewhat, the strands 27 and 28 are still in a suitable upper-shedded position, and when the member 56 moved up from its lower position in Fig. 13 to its upper position in Fig. 14, although it released the strands 25 and 26, they promptly engaged against the under surface 99 of the hook-portion 98 of the shedding-hook 57 so that the strands 25 and 26 are still held in their lower-shedded position. But in view of the continued rotation of the head-plate 83, and the consequent rotation of the four eyelets 96 which form the anchor-points of the cord-strands as they pass through the eyelets 96 of the head-plate 83, the strand 27 is finally shifted transversely of itself to a position near the member 56, so that as the member 56 now moves downward to the position shown in Fig. 15, the hook-surface 100 of the hook-portion 101 of member 56 engages the cord-strand 27 and carries it down from its position in Fig. 14 to that shown in Fig. 15. As the member 56 moves further downward from the position of Fig. 15 to the position of Fig. 16, the sloping cam-surface 102 of the member 56 engages the strand 25 and pushes it out from under the hook-portion 98 of the member 57, thus permitting it to snap up into the up-

per shedded position shown in Fig. 16, and also causes the strand 27 to be slid down along the sloping-surface 103 of the member 57 until it passes beyond the point 104 of the hook-portion 98 and into engagement with the under surface 99 thereof.

Now with the cord-strands 25 and 28 in the upper shed and the cord-strands 26 and 27 in the lower shed, four weft picks will have been interwoven across between the cord-strands as thus shedded, until the head-plate 83 has again rotated to a position corresponding to that illustrated in Fig. 13 and the member 57 again goes through the cycle of operation from its position in Fig. 13 through the positions illustrated in Figs. 14 and 15 to its lowermost position in Fig. 16 in which latter position the strands 27 and 28 will be in the lower shed, and strands 25 and 26 will be in the upper shed, and so on for as long as the machine continues in operation to make the tape 20 having the twisted cord 24 as shown.

If it were to be desired to make corded tape in which the cord was formed of more cord-strands or less cord-strands than four, or in which there were more picks or less picks than four per quarter twist of the cord-strands, it will be obvious to those skilled in the art as to what changes would need to be made in the machine 20.

The invention may be carried out in other specific ways than those herein set forth without departing from the spirit and essential characteristics of the invention, and the present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

We claim:

1. A machine for making corded tape including: drive-means; cord-forming means driven by said drive-means and including a rotary cord-strand twisting-head, and constructed and arranged to twist a plurality of longitudinal cord-strands into a relatively-thick cord extending longitudinally of the tape; weaving-means driven by said drive-means and constructed and arranged to interweave longitudinal warp strands and transverse weft strands into a relatively-thin tape-body, and weave at least some of said weft strands transversely between certain of said twisted cord-strands; the center of rotation of the outer face of said head being substantially to one side of the median plane of the weaving-shed; a shedding-hook adapted to hold certain of said cord-strands in a shedding position; and reciprocable cord-strand-removing and cord-strand-shedding means adapted to repeatedly remove a cord-strand from said shedding-hook and shift another cord-strand into a shedding-position engagement with said shedding-hook.

2. A machine for making corded tape including: drive-means; cord-forming means driven by said drive-means and constructed and arranged to twist a plurality of longitudinal cord-strands into a relatively-thick cord extending longitudinally of the tape; weaving-means driven by said drive-means and constructed and arranged to interweave longitudinal warp strands and transverse weft strands into a relatively-thin tape-body, and weave at least some of said weft strands transversely between certain of said twisted cord-strands; a shedding-hook adapted to hold a plurality of said cord-strands in a shedding position; and reciprocable means adapted to repeatedly

shift a cord-strand into a shedding-position engagement with said shedding-hook.

3. A machine for making corded tape including: drive-means; cord-forming means driven by said drive-means and constructed and arranged to twist a plurality of longitudinal cord-strands into a relatively-thick cord extending longitudinally of the tape; weaving-means driven by said drive-means and constructed and arranged to interweave longitudinal warp strands and transverse weft strands into a relatively-thin tape-body, and weave at least some of said weft strands transversely between certain of said twisted cord-strands; a shedding-hook adapted to hold a plurality of said cord-strands in a shedding position; means adapted to repeatedly remove a cord-strand from said shedding-hook; and means adapted to repeatedly shift a cord-strand into a shedding-position engagement with said shedding-hook.

4. A machine for making corded tape including: drive-means; cord-forming means driven by said drive-means and constructed and arranged to twist a plurality of longitudinal cord-strands into a relatively-thick cord extending longitudinally of the tape; weaving-means driven by said drive-means and constructed and arranged to interweave longitudinal warp strands and transverse weft strands into a relatively-thin tape-body, and weave at least some of said weft strands transversely between certain of said twisted cord-strands; a shedding-hook adapted to hold a plurality of said cord-strands in a shedding position; and reciprocable cord-strand-removing and cord-strand-shedding means adapted to repeatedly remove a cord-strand from said shedding-hook and shift another cord-strand into a shedding-position engagement with said shedding-hook.

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